Got Manure?

Technologies reducing phosphorus in dairy wastes

By the end of 2007, dairy farmers in Central Texas may have several new technologies to help them reduce phosphorus in dairy manure wastewater. Too much phosphorus runoff from the over 165 dairies in the area contributes to poor water quality in the North Bosque River, Leon River and Lake Waco.

Dr. Saqib Mukhtar, a Texas Cooperative Extension specialist in animal waste management, and his team are providing third-party evaluation of the six technologies. Although results are very preliminary, Mukhtar said some of the results are encouraging.

Currently, many dairy farmers flush the manure and its wastewater into lagoons or man-made ponds where it is stored. This wastewater, called effluent, is used for irrigating pastures or crops not consumed by humans and supplies essential plant nutrients including phosphorus to the soils. If the wastewater contains more phosphorus than the crops can use, however, excess phosphorus may eventually end up in the areas' streams and rivers. Too much phosphorus in water can cause algal growth and toxicity in surface waters, killing fish. The EPA has mandated that phosphorus levels in the North Bosque and Leon River watersheds be reduced by 50 percent.

Mukhtar and his Extension team are currently working with two companies—Envirotech, Inc. and Envirolink—to evaluate and demonstrate their technologies. The Envirotech technology uses Bauxsol, a soil-like material, in a filtration system to pull out the phosphorus. Envirolink is using bacteria to reduce phosphorus in the wastewater.

(Top) In the first stage of the electrocoagulation process, dairy effluent enters the mixing tank and lime, coagulants and an emulsion polymer are added and agitated.

(Center) After going through the electrocoagulation process, the effluent passes through the dissolved air flotation clarifier, sludge is removed, and treated water is discharged.

(Bottom) Dairy farmers and other stakeholders observe the Geotube demonstration at the Triple X Dairy in the Leon River watershed.

The first year's technologies—electrocoagulation, developed by Ecoloclean Industries, and geotextile solids separation systems (Geotube™), developed by Miratech Division both appear to reduce phosphorus levels in the processed water, Mukhtar said.

With electrocoagulation technology, dairy wastewater is processed, separating the solids from the liquid. Aluminum and/or iron electrodes are placed in the wastewater stream to attract and coagulate the negatively charged ions of phosphorus. The system then removes the coagulated phosphorus-containing particles, leaving treated water ready to irrigate forage and pasture land.

The Geotextile solids separation system uses large, porous tubes (up to 45 feet in circumference and up to 400 feet long) made from a heavy-duty fabric. The lagoon effluent is pumped into these "large socks" after adding alum or other chemicals to bind and precipitate the phosphorus. As the liquid leaves the porous tubes, solids larger than the pore size of the tube are trapped. Once the tubes are full, the solid waste is hauled off and used as compost or fertilizer in fields with low soil phosphorus and the liquid out of the tube with reduced amount of phosphorus is routed back to the lagoon or to a waste application field.

Dairy producers are positive about learning about the technologies.

"Nearly 100 dairy producers attended a Geotube technology demonstration in the spring and producers were very interested in learning more about the performance and economics of this technology," Mukhtar said.

Mukhtar said each technology company selected for the project will prepare reports, including costs, of its technology. Extension and Texas Water Resources Institute staffers will develop fact sheets on each technology for producers, regulators and agricultural businesspeople so they can make their own decisions about the performance and cost effectiveness of each technology.

Mukhtar sees the technology advisory committee established to review and select technologies for this project as perhaps serving as a clearinghouse for technology providers and producers on future technologies developed.

"The committee could continue to look at new technologies and select the most suitable technologies that have the potential to decrease phosphorus from dairy effluent," he said.

John Cowan, executive director of the Texas Association of Dairymen, agreed.

"Dairymen need good science-based evaluations for any technology they use," Cowan said. A clearinghouse for different technologies, Cowan said, would provide "the farmer some sense and confidence the technology is beneficial and doable."

Before the project, Ned Meister of the Texas Farm Bureau said the bureau was constantly being contacted by vendors who said they had products or processes to help with the dairy wastewater,

"We did not have the capability to validate any of their claims and therefore could not and would not refer the vendors to anyone in the dairy business," Meister said. "Now, when we are contacted by the vendors, we refer them to the program, thus providing them the opportunity to demonstrate their product or process."

The U.S. Environmental Protection Agency, Texas State Soil and Water Conservation Board, Texas Commission on Environmental Quality, Brazos River Authority, Texas Farm Bureau and USDA's National Resources Conservation Service are represented on the technical advisory committee in addition to TWRI, Extension and Texas Agricultural Experiment Station scientists.